

CLAIMS

1. A light source, comprising:
at least one LED; and
5 an interface coupled to the at least one LED, the interface being adapted to engage mechanically and electrically with a conventional pool light socket.
2. The light source of claim 1, wherein the conventional pool light socket includes a screw type light socket, and wherein the interface is adapted to engage mechanically and electrically with the screw type light socket.
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3. The light source of claim 1, wherein the conventional pool light socket includes a bayonet type light socket, and wherein the interface is adapted to engage mechanically and electrically with the bayonet type light socket.
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4. The light source of claim 1, wherein the conventional pool light socket includes a multi-pin light socket, and wherein the interface is adapted to engage mechanically and electrically with the multi-pin light socket.
- 20 5. The light source of claim 1, wherein the conventional pool light socket includes fluorescent light socket, and wherein the interface is adapted to engage mechanically and electrically with the fluorescent light socket.
6. The light source of claim 1, wherein the conventional pool light socket includes a halogen light socket, and wherein the interface is adapted to engage mechanically and electrically with the halogen light socket.
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7. The light source of claim 1, wherein the conventional pool light socket includes a double-ended halogen light socket, and wherein the interface is adapted to engage mechanically and electrically with the double-ended halogen light socket.
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8. The light source of claim 1, wherein the conventional pool light socket includes and MR-16 light socket, and wherein the interface is adapted to engage mechanically and electrically with the MR-16 light socket.
- 5 9. The light source of claim 1, wherein the conventional pool light socket includes a wedge type light socket, and wherein the interface is adapted to engage mechanically and electrically with the wedge type light socket.
10. An illumination method, comprising acts of:
- 10 engaging at least one light source mechanically and electrically with a conventional light socket, the at least one light source including at least one LED; and providing at least power to the at least one light source via the conventional pool light socket.
- 15 11. An apparatus, comprising:
- at least one light source adapted to be supported by one of a pool and a spa to illuminate a liquid contained in the one of the pool and the spa, the at least one light source including at least one LED.
- 20 12. The apparatus of claim 11, wherein the one of the pool and the spa has a range of typical liquid levels of the liquid during use, and wherein the at least one light source is adapted to be disposed below the range of typical liquid levels.
13. The apparatus of claim 12, further including an encapsulant to protect the at least one
- 25 light source from moisture.
14. The apparatus of claim 13, wherein the encapsulant is in contact with at least the at least one LED.
- 30 15. The apparatus of claim 14, wherein the encapsulant includes a conformal coating.

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16. The apparatus of claim 11, further including an interface coupled to the at least one light source, the interface being adapted to engage mechanically and electrically with a conventional light socket supported by the one of the pool and the spa.
- 5 17. The apparatus of claim 16, wherein:
the conventional light socket includes a wedge type light socket; and
the interface is adapted to engage mechanically and electrically with the wedge type light socket.
- 10 18. The apparatus of claim 16, wherein:
the conventional light socket includes a screw type light socket; and
the interface is adapted to engage mechanically and electrically with the screw type light socket.
- 15 19. The apparatus of claim 16, wherein:
the conventional light socket includes a multi-pin light socket; and
the interface is adapted to engage mechanically and electrically with the multi-pin light socket.
- 20 20. The apparatus of claim 11, wherein the at least one light source is adapted to generate radiation of different colors without requiring the use of a color filter.
21. The apparatus of claim 11, wherein the at least one LED includes at least two differently colored LEDs.
- 25 22. The apparatus of claim 11, wherein the at least one LED includes at least one red LED, at least one green LED, and at least one blue LED.
23. The apparatus of claim 11, wherein the at least one LED includes at least two
30 independently controllable LEDs.

24. The apparatus of claim 11, wherein the at least one light source includes at least two independently controllable light sources.
25. The apparatus of claim 24, wherein the at least two independently controllable light sources include at least two independently addressable light sources.
26. The apparatus of claim 11, wherein the at least one light source is adapted to generate a remotely controllable variable radiation output.
27. The apparatus of claim 11, further comprising at least one controller coupled to the at least one light source to control radiation output by the at least one light source.
28. The apparatus of claim 27, wherein the at least one controller is adapted to control a color of the radiation output by the at least one light source.
29. The apparatus of claim 27, wherein the at least one controller is adapted to control an intensity of the radiation output by the at least one light source.
30. The apparatus of claim 27, wherein:
the at least one controller outputs at least one control signal to the at least one light source to control the radiation output by the at least one light source; and
the at least one control signal includes at least one pulse width modulated signal.
31. The apparatus of claim 27, wherein:
the at least one controller outputs at least one control signal to the at least one light source to control the radiation output by the at least one light source; and
the at least one control signal includes at least one variable analog signal.
32. The apparatus of claim 27, wherein:
the at least one LED includes at least a first LED and a second LED, the first and second LEDs having different colors; and

the at least one controller is adapted to control a first intensity of the first LED and a second intensity of the second LED.

33. The apparatus of claim 27, further comprising at least one storage device, coupled to the at least one controller, to store at least one illumination program, wherein the at least one controller is adapted to execute the at least one illumination program so as to control the radiation output by the at least one light source.

34. The apparatus of claim 27, wherein the at least one light source includes at least a first light source and a second light source each adapted to be supported by the one of the pool and the spa and to illuminate the liquid contained in the one of the pool and the spa, wherein the at least one controller includes at least a first controller coupled to the first light source and a second controller coupled to the second light source, and wherein:

each of the first controller and the second controller is independently addressable; and

the first controller and the second controller are coupled together to form a networked lighting system.

35. A light fixture for one of a pool and a spa, comprising:

at least one LED; and

an interface coupled to the at least one LED, the interface being adapted to engage mechanically and electrically with a wedge type light socket supported by the one of the pool and the spa.

36. The light fixture of claim 35, wherein the interface includes means for engaging mechanically and electrically the at least one LED with the wedge type light socket.

37. The light fixture of claim 35, wherein the at least one LED includes at least two differently colored LEDs.

38. The light fixture of claim 35, wherein the at least one LED includes at least one red LED, at least one green LED, and at least one blue LED.
39. The light fixture of claim 35, wherein the one of the pool and the spa has a range of typical liquid levels of the liquid during use, wherein the wedge type light socket is located below the range of typical liquid levels, and wherein the light fixture further includes:
- an encapsulant to protect the at least one LED from moisture.
40. The light fixture of claim 39, wherein the encapsulant is in contact with at least the at least one LED.
41. The light fixture of claim 40, wherein the encapsulant includes a conformal coating.
42. The light fixture of claim 35, wherein the interface includes two pins to engage at least electrically with the wedge type light socket.
43. The light fixture of claim 42, wherein each pin of the two pins has a diameter of approximately 0.09 inches.
44. The light fixture of claim 42, wherein each pin of the two pins has a length of approximately 0.46 inches.
45. The light fixture of claim 42, wherein the two pins are separated from each other by a distance of approximately 0.25 inches.
46. The light fixture of claim 42, wherein:
- each pin of the two pins has a diameter of approximately 0.09 inches;
- each pin of the two pins has a length of approximately 0.46 inches; and
- the two pins are separated from each other by a distance of approximately 0.25 inches.

47. The light fixture of claim 42, wherein at least one pin of the two pins includes at least one perturbation to facilitate mechanical engagement of the interface and the wedge type light socket.
- 5 48. The light fixture of claim 47, wherein the at least one perturbation includes at least one indented groove formed at least partially around a circumference of the at least one pin.
- 10 49. The light fixture of claim 48, wherein the at least one perturbation includes at least one continuous indented groove formed completely around the circumference of the at least one pin.
- 15 50. The light fixture of claim 49, wherein the at least one continuous indented groove has a perturbation diameter of approximately 0.065 inches.
51. The light fixture of claim 47, wherein the at least one perturbation includes at least one protruding ring formed at least partially around a circumference of the at least one pin.
- 20 52. The light fixture of claim 51, wherein the at least one perturbation includes at least one continuous protruding ring formed completely around the circumference of the at least one pin.
- 25 53. The light fixture of any of claims 47-52, wherein the at least one perturbation is located approximately 0.17 inches from an end of the at least one pin.
- 30 54. The light fixture of claim 47, wherein a first pin of the two pins includes a first perturbation and a second pin of the two pins includes a second perturbation to facilitate mechanical engagement of the interface and the wedge type light socket.

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55. The light fixture of claim 42, wherein the interface includes at least one rubber grommet to facilitate mechanical engagement of the interface and the wedge type light socket.

5 56. The light fixture of claim 55, wherein:

each pin of the two pins has a diameter of approximately 0.09 inches;

each pin of the two pins has a length of approximately 0.46 inches;

the two pins are separated from each other by a distance of approximately 0.25 inches;

10 a first pin of the two pins includes a first perturbation and a second pin of the two pins includes a second perturbation to facilitate mechanical engagement of the interface and the wedge type light socket;

the first perturbation is located approximately 0.17 inches from an end of the first pin; and

15 the second perturbation is located approximately 0.17 inches from an end of the second pin.

57. The light fixture of claim 56, wherein:

20 the first perturbation includes at least one first indented groove formed at least partially around a circumference of the first pin; and

the second perturbation includes at least one second indented groove formed at least partially around a circumference of the second pin.

25 58. The light fixture of claim 57, wherein each of the first and second perturbations has a perturbation diameter of approximately 0.65 inches.

59. The light fixture of claim 56, wherein:

the first perturbation includes at least one first protruding ring formed at least partially around a circumference of the first pin; and

30 the second perturbation includes at least one second protruding ring formed at least partially around a circumference of the second pin.

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60. The light fixture of claim 56, wherein the one of the pool and the spa has a range of typical liquid levels of the liquid during use, wherein the wedge type light socket is located below the range of typical liquid levels, and wherein the light fixture further includes:

5 an encapsulant to protect the at least one LED from moisture.

61. A method of illuminating a liquid in one of a pool and a spa, comprising acts of:

 a) engaging at least one light fixture mechanically and electrically with a wedge type light socket supported by the one of the pool and spa, the at least one light fixture including at least one LED; and

10 b) providing at least power to the at least one light fixture via the wedge type light socket to illuminate the liquid.

62. The method of claim 61, wherein the one of the pool and the spa has a range of typical liquid levels of the liquid during use, wherein the wedge type light socket is located below the range of typical liquid levels, and wherein the act a) comprises an act of:

15 engaging the at least one light fixture, below the range of typical liquid levels, with the wedge type light socket.

20 63. An apparatus, comprising:

 at least one LED;

 circuitry electrically coupled to the at least one LED; and

 an encapsulant in contact with the at least one LED and the circuitry to protect

25 the at least one LED and the circuitry.

64. The apparatus of claim 63, wherein the encapsulant is adapted to protect the at least one LED and the circuitry from moisture.

30 65. The apparatus of claim 63, wherein the encapsulant includes a conformal coating of the at least one LED and the circuitry.

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66. The apparatus of claim 63, wherein the encapsulant includes a potting material.
67. The apparatus of claim 63, wherein the encapsulant is essentially light transmissive.
- 5 68. The apparatus of claim 63, wherein the encapsulant includes at least one of the group of materials consisting of silicones, epoxies, glass resins, polysiloxanes, acrylics, and polyimides.
69. The apparatus of claim 63, wherein the encapsulant includes an aerosol acrylic.
- 10 70. A method for treating an apparatus comprising at least one LED and circuitry coupled to the at least one LED, the method comprising an act of:
- a) providing an encapsulant in contact with the at least one LED and the circuitry to protect the at least one LED and the circuitry from moisture.
- 15 71. The method of claim 70, wherein the act a) includes an act of:
- b) conformally coating the at least one LED and the circuitry with the encapsulant.
- 20 72. The method of claim 71, wherein the act b) includes an act of:
- depositing the encapsulant on the at least one LED and the circuitry using a vacuum deposition technique.
73. The method of claim 70, wherein the act a) includes an act of:
- 25 providing a potting material in contact with the at least one LED and the circuitry.